

Southern Pacific #331

BOX CAR

Research and Restoration Report



S.P.
331

CAPY40000
LTWT 17800SPK5 24

11/89
Railroad
THE SOUTHERN PACIFIC RAILROAD

NARROW-GAUGE BOXCAR

NO. 331

REPORT ON RESEARCH AND RESTORATION

by

THE RESTORATION RESEARCH STAFF

CALIFORNIA STATE RAILROAD MUSEUM

Department of Parks and Recreation

February 5, 1979

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PREFACE

This report is an account of the research and restoration work performed on narrow gauge boxcar S.P. No. 46 by the staff of the California State Railroad Museum between February and May, 1977. As the first restoration project undertaken by the Museum, it proved to be a learning experience of inestimable value. From that early effort has come a growing command of the research and restoration techniques that have been applied successfully to other pieces in the Museum's collection.

During the course of research and restoration, the boxcar was commonly referred to as S.P. 46, the designation it bore upon arrival. That practice has been continued in this report, although the car has been restored to its 1920's appearance as S.P. 331.

The following description of the restoration process is intended for the use of the Museum staff. At the time of research and restoration, footnoting was not practiced. Those interested in more detailed information will find the complete data on S.P. 46, including tracings and photographs, in the CSRM archives.

HISTORY

S.P. narrow gauge boxcar No. 331, now in the collection of the California State Railroad Museum, is a symbol of the workaday life of railroading in the western United States. Constructed about 1891 for the Oregonian Railroad as boxcar No. 116, the narrow gauge freight carrier was sold to the South Pacific Coast Railway in January 1899 and relettered S.P.C. No. 360. Shortly thereafter, the car was modernized with automatic knuckle couplers, Westinghouse air brakes, and various safety devices. In 1904, it was transferred to Southern Pacific Line's Carson & Colorado Division to help accommodate a freight traffic surge that followed the Tonopah mining boom, continuing in service as S.P.C. No. 360. In 1906, the boxcar was sold to S.P.'s subsidiary Nevada & California Railway, becoming their second No. 331. When the Nevada & California was taken over in 1912 by the Central Pacific Railway, the title to No. 331 was also transferred to the new operators of that narrow gauge line. A major rebuilding of the car in 1924 increased its capacity to 20 tons by extensively modifying the Thielsen patent trucks from their original condition. In 1927, No. 331 was relettered Southern Pacific No. 331. During conversion for hauling bulk soda-ash in 1931, small doors were installed in the car sides and a horizontal sliding door applied to one end. These doors were removed during a 1947 shopping, at which time the end sills and most of the body framing were renewed. Provision was made in the car framing for reinstallation of the small side hatches but not for the end door. At that time, the car was resided, painted, and assigned S.P. No. 46; it remained in freight service until April 30, 1960.

Boxcar No. 46 was officially presented to the Pacific Coast Chapter of the Railway & Locomotive Historical Society, Inc., on June 17, 1960, and was moved to Western Pacific Railroad property in West Oakland, California, for storage. In September 1964, it was moved to a second storage location inside the former Key System Railway Inspection Barn at Oakland. The Pacific Coast Chapter presented the boxcar to the State of California on August 10, 1969 for restoration and display in the California State Railroad Museum. On February 24, 1977, former S.P. No. 46 was trucked from Oakland to the CSRM's restoration facility at the Southern Pacific Transportation Company's Unit Shop, Sacramento, for research and renovation.

Additional Note: Information taken from a letter of Richard C. Datin, authority on Carson & Colorado Railway and Southern Pacific's Keeler Branch. Letter dated 3-6-77 and addressed to Stephen Drew, Curator, CSRM.

"Box #46

One end door, small side doors applied for handling Bulk Soda Ash for Natural Soda Products Co. of Keeler, California. April, 1931.

1-1/2" Channel Iron added to trucks 5/30/24*

Yoke draft rigging
Arch Bar Trucks
Metal Truck Bolsters
Journal size - 3-1/2 x 6-1/2
Steel Brake beams added 5/30/24
Weighed Sparks 5/30/24 17,800
Keeler 10/19/32 18,200

After 1946-47 relettering, the "S.P." letters were 7" in height. Prior this date they were 9" high according to my notes and stencil. Use of the emblem seems to have disappeared after renumbering. In some cases it was blacked out.

*Note: 1-1/2" channel iron not found on trucks during physical research.

...add after your 1900 date re. knuckle couplers that these cars came to the C&C, they were stripped of their draft gear, and the ever-popular "Sams" patent couplers were installed. Majority of the work, as you know, took place at Carson City during the latter part of 1904 and into the first of 1905. SPC cars were equipped with Sams couplers, pins, safety levers, springs and links as well as air hoses wherever required.

...#46 was one of 38 cars on the line used in handling the bulk soda. This from ca. 1930 on."

1931?
modified

CONDITION UPON RECEIPT

When former Southern Pacific narrow gauge boxcar No. 46 arrived at the Unit Shop in the Southern Pacific Sacramento yards on February 24, 1977, the following evaluation was made of its condition:

Presently lettered S.P. 46, the car is in fair condition. The car has apparently not been altered since its retirement from Keeler Branch Service in 1960. The exterior paint of the car is in poor shape, weathered and peeling. The lettering appears as it was last applied by S.P. at its Owenyo facility in 1960. The car is badly humpbacked, caused by having the truss rods too tight. The roof of the car is also in fair condition, though most of the paint has weathered off and the double lap sheathing is somewhat loose.

The roof and side sheathing has been damaged by crane loading cables during movement from 1960 through 1964. The door stops and door pulls are not identical. The car brakes have been detached from the staff which was raised out of the staff step. The brake ratchet was elevated to a position just below the wheel and does not engage the pawl; this was done to decrease the overall height of the boxcar during road-movements. The brake retaining valve and associated piping is gone. Inside the car, one rafter has been replaced and its tie-bar cut out. The frame is in good condition generally, with no visible breaks or severe cracks in any timbers. The intermediate truss rod on side "A" has been broken and repaired, as have the truss rods in the "B" end body bolster and "A" end bulkhead. Structurally the car is sound and complete.

RESEARCH

Introduction

The documentary material available on S.P. 46 and similar narrow gauge freight equipment proved to be quite spare. Southern Pacific Company records yielded pivotal maintenance dates such as the 1924 rebuilding of No. 46 and its residing in 1946-47. Photographs in the CSRM archives gave some indication of the operational appearance of narrow gauge boxcars. The greatest source of information, however, was clearly the car itself, and it was therefore examined extensively for any physical evidence of its service history.

The markings and lettering that appeared on the car when it was received and lettering found during our inquiry were photographed and traced, providing an exact pictorial account of the research process and furnishing us with a set of overlay tracings of each area. The locations of all markings found on the car body were defined in terms of their relation to basic items of car construction. Whenever practical, for example, both vertical and horizontal dimensions were taken from the top of the fascia boards and from the car body ends. Rather than locate individual letters and markings, entire tracing sheets were positioned from the datum lines, thus providing a simple and accurate reference and enabling us to replace lettering in its proper location. The tracings are now housed in the CSRM archives in West Sacramento.

No unusual loading, safety appliance or hardware information, as frequently applied to similar standard gauge cars of like vintage, was found on the car. Some markings were uncovered that exhibited heavy weather damage. Other

sections of lettering, in contrast, were well preserved by subsequent overpainting. The interior of the boxcar bore no car identification initials or numbers. Some penciled graffiti, such as "talcbestos" and "126 Sacks", was visible on interior walls and framing. Stenciled words and sentences, such as "KEEP YOUR STATION CLEAN KEEP THIS DOCK CLEAN DO NOT LEAVE WASTE BAGS" and "MEDAL BRAND ROOF", were evident on the walls and rafters, respectively. The bulk of the data on S.P. 46, however, was derived from the exterior of the car.

The designations for the sides and ends of the boxcar were determined, for our purposes, by the position of the brake-staff (brakewheel). The side/end of the car on which the brake-staff was found was called "A"; the opposite side/end of the car was called "B". The same rules were applied to doors on the car: Door "A" was on side "A", and so forth. See figure 1 .

Car Ends

Three distinct layers of "boxcar red" paint were found on the ends of No. 46. The bottom layer had a light brownish tint to it. The second layer had a more violet cast and came closest to the typical oxide red used on freight cars. The outermost layer was quite dark, approaching maroon.

In the upper right corner of each end were the white stenciled figures:

S P

4 6

Scraping in these areas revealed three applications of lettering, one on top of the other, and each slightly out of alignment with the rest.

On the "B" end, the remains of a fourth "4" were discovered beneath the other stenciled fours. Since no additional "4" was found on the "A" end, it was postulated that the extra numeral may have been an error in painting, corrected when the next coat was applied. It may also have been the remnant of an older paint job which was already nearly gone when the car was repainted.

Car Sides

Like the ends of the car, the sides exhibited three layers of "boxcar red" paint. In the reporting mark areas three applications of SP. 46 were found.

The top two layers of markings were nearly identical in their placement, while the bottom layer was slightly out of register with the other two.

Lower down on the sides of the car, below the reporting marks, was stenciled information concerning capacity and light weight:

CAPY 40000

LT WT 18900

Three layers of markings were uncovered, with each succeeding application placed higher and farther to the right of the one before it. The total movement measured approximately two inches in each direction. (See Phot. # 1).

The remnant of a fourth layer of markings was discovered under the other three on both sides of the car, but careful scraping revealed only the letters "LT W". This evidence suggests that the capacity and light weight information was lettered four times, while the reporting marks were applied to the sides

of the car only three times. In conjunction with the fourth "4" on the "B" end of the car, however, the "LT W" also raises the possibility of an earlier paint job which was worn away, leaving only fragments on the car. Indeed, it seems unlikely that a car which ran in an area of extreme climatic variations (as No. 46 did) would have been painted only three times between its residing in 1947 and its retirement in 1960. The empirical evidence found on the car, however, is too thin to support a solid conclusion.

Repacking Information

The bearing repacking information for S.P. Box No. 46 was located in the lower righthand corner of each side of the body. The information visible upon receipt consisted of: RPKD OYO 1 4 60.

SP

This date appeared on both sides and coincided with information on the brake cylinder. (See section Air Brake Reservoir.)

The wood surfaces upon receipt were rough and weathered, with many layers of paint applied over the area. Because of this surface irregularity, it was difficult to scrape the paint in a controlled manner. Therefore, liquid paint remover was used to reveal underlying layers. This process required great care due to the fragile condition of the paint. (See Photo # 2.)

After uncovering the markings on both areas, the following data were revealed. For the most part, the information was identical for both areas.

First Level

RPKD OYO 1 4 60
SP

Most recent date.

Second Level

12 18 58

RPKD OYO appears to have been
SP reused.

Third Level

9 13 57

This date appears twice on both sides. The upper one is below the two subsequent dates, sharing the RPKD OYO

SP. The second one is located about 3" lower and is complete with its own location information.

Fourth Level

9 7 56

This date appears in the lower area and shares the location information from level three.

Fifth Level

55

On the left side panel is a remnant of a 1955 repack date.

Sixth Level

On the right side panel is a fragment from a possible 1940's date. This notation is located directly below and beneath the third and fourth levels.

Miscellaneous

SP
OYO

On the left panel, several stray markings (SP & OYO) were located immediately beneath the lower RPKD information. It is surmised that these data might correlate to an earlier notation than the 1956, possibly either to the 1955 or to the unknown data discovered in the lower area of the right side.

Beyond the information mentioned above, no further data were discovered. If the obscure data suggesting a 1940's date could be substantiated, this would be in keeping with the fact that the car was resided in 1946-47.

Truck Bolster Lettering

The inside surfaces of both truck bolsters show remnants of two applications of "S.P. 331", in two distinct styles. The outside of the bolsters have no lettering on them; either nothing was applied here, or any lettering once present has been weathered off.

The earliest information reads "S.P. 331" in white, 2-inch letters. This appears just to the left of center on each bolster. Over this is an application of "S.P. 331" in 3-inch figures, carefully centered on the bolster surfaces. Both of these reporting marks are in white on black paint, and the later of the two has had one layer of black applied over it. This, in turn, has been covered by several coats of boxcar red.

Bolster Paint Chronology In Condensed Form - Read Up

Two or three coats (approx.) boxcar red

One coat black

S.P. 331

One coat black

S.P. 331

Three coats black

Metal surface

Paint Configuration of the Underframe

Inspection of the underframe of the car disclosed several coats of "boxcar red" on the wooden portions and at least two coats on the metal parts.

Through careful scraping, it was determined that at the oldest layer some components were painted red as on the body, and others painted black as on the trucks. The evidence indicates that the sills and body bolsters as well as the end sills were painted red, while all other parts, both metal and wood, that hung below the sills were painted black.

To support this paint style, the findings can be divided into what is on metal and what is on wood. The lower black paint layer is on all the metal parts including the following:

- sill step
- truss rods
- truss-rod saddles
- queenposts
- floating lever bracket
- lever carrier
- brake cylinder and other brake parts
- brake pipe
- body bolster truss-rod washer -- black paint was found only on the right side near B end. This could be due to replacements or the weathering by the elements causing most of the paint to be gone before the repainting with the red.
- body center-plate
- body side bearings -- although no paint was left on these parts, they were probably black and matched the body center plate.
- draw spring
- keys in the draw timbers

The only metal piece not conforming to this scheme is the brake relief valve pull bracket which has only one coat of red paint. It looks like a replacement piece so the earlier paint color is indeterminate. Also, the air hose and hose connection which extends from the B end of the car is red.

The wooden parts having a coat of black paint are:

- brake cylinder block
- brake reservoir block
- needle beams -- the black color all along the piece toward the B end is both paint and charring.
- draw timbers -- right timber on B end is black. The left side has red only and could be a replacement since both timbers on the A end are black.

The sills and everything above them were painted red. There was some evidence of black paint which could have been overspray from painting the truss rods which parallel the sill. Along the right side sill, black paint was found near the body bolster on the B end. There is also burning or charring along the sill where bolts were probably replaced at one time. There was no evidence of black paint along the rest of the sill. The right intermediate sill also had black paint on the B end next to the truss rod. The center sills had no paint left on them except for traces of red. The sills and end sills as well seem to have been painted red only.

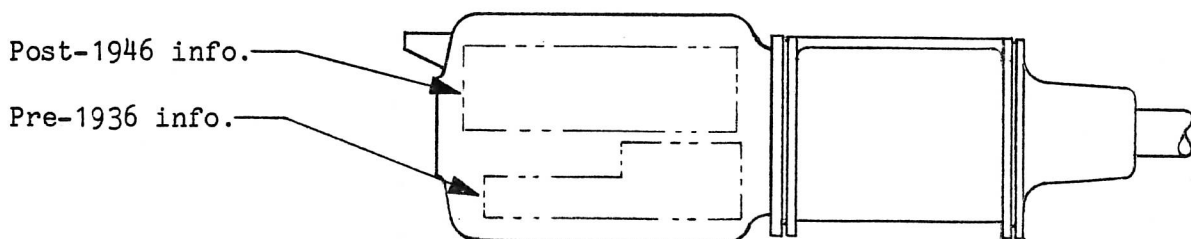
Paint samples support this report, showing that all metal parts and those wooden parts as indicated had a first layer of black paint and second and third layers of red. Most of the wood, such as the sills, had three layers of red paint. The body bolsters had several coats of red paint which would indicate they were probably painted every time the trucks were done. It might also be noted that the general condition of the paint on the underframe showed extreme weathering.

Air Brake Reservoir

When received, the air brake reservoir bore one set of servicing marks -

OYO 1 4 60 - denoting work completed at Owenyo. This date coincided with
SP
the repacking information found on the car's sides. Prior to exploration of the reservoir exterior, it was noted that there was a thick coating of paint present. The paint was red lead in color, with traces of black on the cylinder and reservoir ends. The preliminary search for information on the reservoir was conducted with a sandblaster and immediately revealed a profusion of layered markings. Because of the coarseness of the blasting process, work was continued with an X-acto knife, but it was virtually impossible to recover all of the layers of paint on the reservoir surface. (See Photo # 3 .)

Preliminary work revealed that the information was arranged in two separate groups. The recent markings, of which the earliest date was "2-13-46", appeared on the area of the reservoir above the center line. It was in this area that the paint was the thickest, with numerous layers of date information. The second group of information, which contains the older dates, was located in the area below the center line and the cast markings on the tank. It was in this area that a useful date of 1923 and a possible earlier date of 1918 were discovered.



The physical characteristics of the paint varied from area to area. Much like the paint on the reservoir on S.P. Tank Car No. 145, some areas were dry and brittle, while others were soft and pliable. The original black paint had remained in a soft condition, almost sticky and tacky. The red paint, on the other hand, was brittle and broke off in sizable chunks. This probably was a result of the thick layering and the failure of the painter to clean the area before marking it.

Investigation of the air brake reservoir revealed the following layers of information over and above the cast lettering data:

Level One

OYO 1 4 60
SP

Information present on reservoir upon acquisition.

Level Two

RPKD 4 14 59

It is not clear whether RPKD belongs with the date.

Level Three

YO SP

Fragmented information denoting Owenyo and Southern Pacific. Could belong to 1958 date.

Level Four

12 18 58

Service date.

Level Five

9 13 57

Service date.

Level Six

OYO

Fragment of OYO (Owenyo).

Level Seven

SP

Directly under level six OYO.

Level Eight

YO SP

Another reference to Owenyo and Southern Pacific. Appear to belong together.

Level Nine

OYO S

Appear to belong together.

Level Ten

OY

At or near the bottom of the upper area of markings.

Level Eleven

2 13 46

Earliest date found on upper area.

Older information was located below the cast lettering data:

Level Twelve

OYO 6 3 36

First discovered information in the lower area of the reservoir. The date and location information may belong together. Characters are 1" in height.

Level Thirteen

OYO 8 3 34

In register with level twelve, characters are 1" in height.

Level Fourteen

OYO
4 . 14. 23

This information was clear and definable. The configuration shows that the lettering was spaced around the raised cast information on the reservoir and the numerals were divided by periods. Characters are 1" in height.

Level Fifteen

At this level, there were definite remnants of green paint. Though not legible, these markings raise an interesting question as to purpose and content.

Level Sixteen

7 11

Composed of distinctive brushed strokes, the remnants of this old notation do not provide complete information. Characters are 2" in height.

Level Seventeen

6 18

Appears to be the oldest marking on the reservoir. The numerals are hand painted and crude in appearance. Characters are 2-1/2" in height.

This information description does not include all of the data which was present on the reservoir. Because of the multitude of layers and the impossibility of exposing each one, many were lost. There is, however, a good representation of dates ranging from 1918 to 1960, and the missing dates can be assumed to have been in the same configuration as their neighbors.

As mentioned earlier, the data described were placed in two distinct groups. Information which dated from 1946 was found above and over the raised cast lettering on the reservoir. Because some of the notations were stenciled over the cast lettering, it is assumed that this area was encrusted to such a degree that the casting lettering was covered. The encrustation was so complete upon acquisition that there was no evidence of the castings except for a definite raised area. The paint layers in this area were composed of red lead paint with no evidence of black paint, leading to the conclusion that as far back as 1946 the reservoir was painted red.

The lower area of the reservoir, below the cast lettering, was painted with layers of black paint. Numerous layers of date fragments ranging from 1918 to 1936 existed in this area. The information was completely covered with many

layers of dry brittle red paint. Apparently, as the center cast area became encrusted and smooth, the lettering migrated first to the position above and then finally over the cast area near the center line.

The configuration of the 1923 information presents an attempt to stencil around the lower perimeter of the cast lettering. This date helps to confirm a 1920's appearance for the boxcar and was the clearest of the older notations. All of the other remains of the early markings were fragmentary and therefore not adequate for possible use.

RESTORATION

After extensive examination of the boxcar, it was established that during its May 30, 1924 rebuild none of the original 1891 wood components were reused. All wood components were of new materials utilizing wire nails. Also at that time, the body and trucks were modified and upgraded for heavier load capacity. This, with the addition of steel brake beams, created a completely new car, and for that reason it was not deemed practical to restore the car to a pre-1924 appearance.

Small side doors for loading bulk soda-ash had been added in 1931 and, when the car was resided in 1947, the door framing remained. Consideration was given to restoring the boxcar to its 1931-47 condition, complete with the side doors, but it was felt that the car could be displayed most effectively as part of a 1920's freight train along with other restored narrow gauge equipment from that era. The decision was made, therefore, to take the boxcar back to the date when its major structural modification was completed, May 30, 1924.

Preliminary plans in the restoration process called for straightening the frame and residing and reroofing the car body, thereby reconstituting a mid-twenties style car. Further alterations included:

1. Straightening bent truss rods, stirrups, door tracks, grab irons, etc.
2. Replacing broken or patched truss rods, retainer piping and valve, outer roof, and underlying felt layer.
3. Stripping (by hot-tanking or sandblasting) all hardware, i.e., grab irons, corner plates, truck frames, brake gear, couplers, wheels, brake reservoir and cylinder, etc.

4. Blowing out all remaining soda-ash and washing interior of body.
5. Disassembling the trucks, cleaning journals, reassembling and painting all hardware except wheels.
6. Resetting gear on brake staff.

The interior of the boxcar was in very good condition, since it has not been exposed to the elements since being reworked in 1947. For this reason, the interior was not renovated. The side door framing was left intact, although it was not contemporary to the proposed historical period. It was felt by the research and restoration staff that a freight display inside the car could screen the framework from public view.

By restoring the car to its 1920's appearance, its railroad identification number was returned to 331. After the major restorative carpentry was completed, the body was sprayed with three coats of Southern Pacific standard boxcar red paint, which was an extremely close match to the oldest paint found on the car during physical research. The patterns for the 9-inch "S.P." lettering were taken from an authentic metal stencil once used by car painters at Keeler. The paint shops at Southern Pacific's Sacramento Shop provided 4-inch alphabet stencils which were retraced for use on the car ends, and similar 3-inch stencils for the car capacity and weight information. The capacity and weight data were selected from the day and date that No. 331 was released from reconstruction and replaced in regular freight service. These capacity markings were also altered to reflect the appropriate content limits of 1924. Extensive scraping on the air cylinder had provided a firm 1923 service date for the brake system, and, as the journals were customarily repacked during the same servicing, the 1923 date was applied to both the brake cylinder and the repacking information areas in 1-inch and 1-1/2-inch

stenciling. The car's side emblem had not been reapplied after the 1947 residing, and no photographic documentation of it could be found. Consequently, the emblem for S.P. 331 was selected from a set of typical markings that were used on similar narrow gauge freight equipment of the period. It was felt that such a representative emblem was a valid choice, consistent with the car's history and restoration. (See Photo # 6 .)

Restoration of S.P. 331 was completed in May of 1977. The car was then trucked to an indoor storage facility in West Sacramento where it will remain until placed in the History Building of the California State Railroad Museum.

CHRONOLOGY

- ca. 1891 Built and placed in service as Oregonian Railroad n.g. boxcar No. 116; wood body and underframe, length 30 feet, width 7 feet 8 inches, capacity 1,281 cubic feet, 10 tons.
- 1-4-1899 Transferred to South Pacific Coast Railway becoming boxcar No. 360, value \$400.00.
- ca. 1900 Knuckle couplers, Westinghouse air brakes, and safety appliances applied.
- 1903-1906 Transported to Carson & Colorado Division, Southern Pacific Co., in freight service on a per diem basis as S.P.C. No. 360. *1904 p.1*
- 7-1-1906 Sold to Nevada & California Railway becoming second boxcar No. 331, value \$195.00.
- 3-1-1912 Revised valuation \$150.00.
- ca. 1912 Relettered Central Pacific Railway n.g. boxcar No. 331.
- 5-30-1924 Completely rebuilt: truss rods, steel brake beams, metal truck bolsters, capacity increased to 20 tons. Weighed at Sparks, Nev., 5-30-24, 17,800 lbs. lt.
- ~~ca. 1927~~ Relettered Southern Pacific Lines No. 331. *p.1 1927*
- 4-4-1931 Small doors on upper sides installed for soda-ash loading, with one small sliding door at top center of "B" end. Lt. wt. 18,900 lbs.
- 10-19-1932 Weighed at Keeler, Calif., 18,200 lbs. lt. wt.
- 3-14-1947 Renumbered to S.P. No. 46. Side and end doors removed, car resided and painted.
- 4-30-1960 Last operated by Southern Pacific on Keeler Branch.
- 6-17-1960 Presented to Pacific Coast Chapter, R.&L.H.S., Inc., and later moved to the Western Pacific Railroad Co. sandhouse, West Oakland, Calif., for storage.
- 9-1964 Trucked to former Key System Railway Inspection Barn, Oakland, for storage.
- 8-10-1969 Presented to State of California by Pacific Coast Chapter, R.&L.H.S., Inc.
- 2-24-1977 Trucked to Southern Pacific Unit Shop, Sacramento, and restored to a circa 1924 appearance as Southern Pacific Lines narrow gauge boxcar No. 331.

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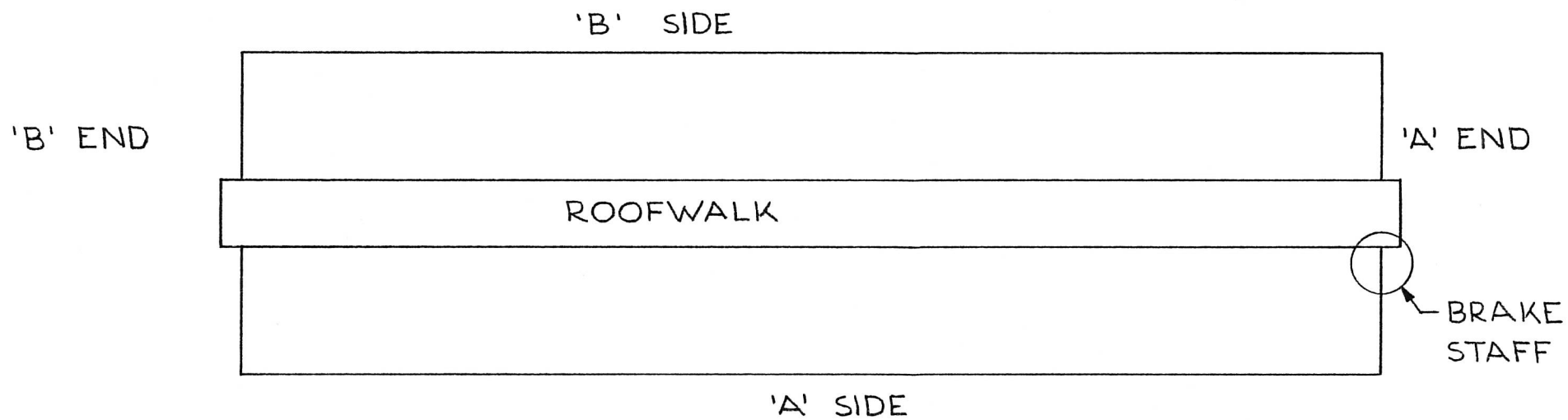


FIGURE 1.



Photo #1 Car side

CSRM PHOTO

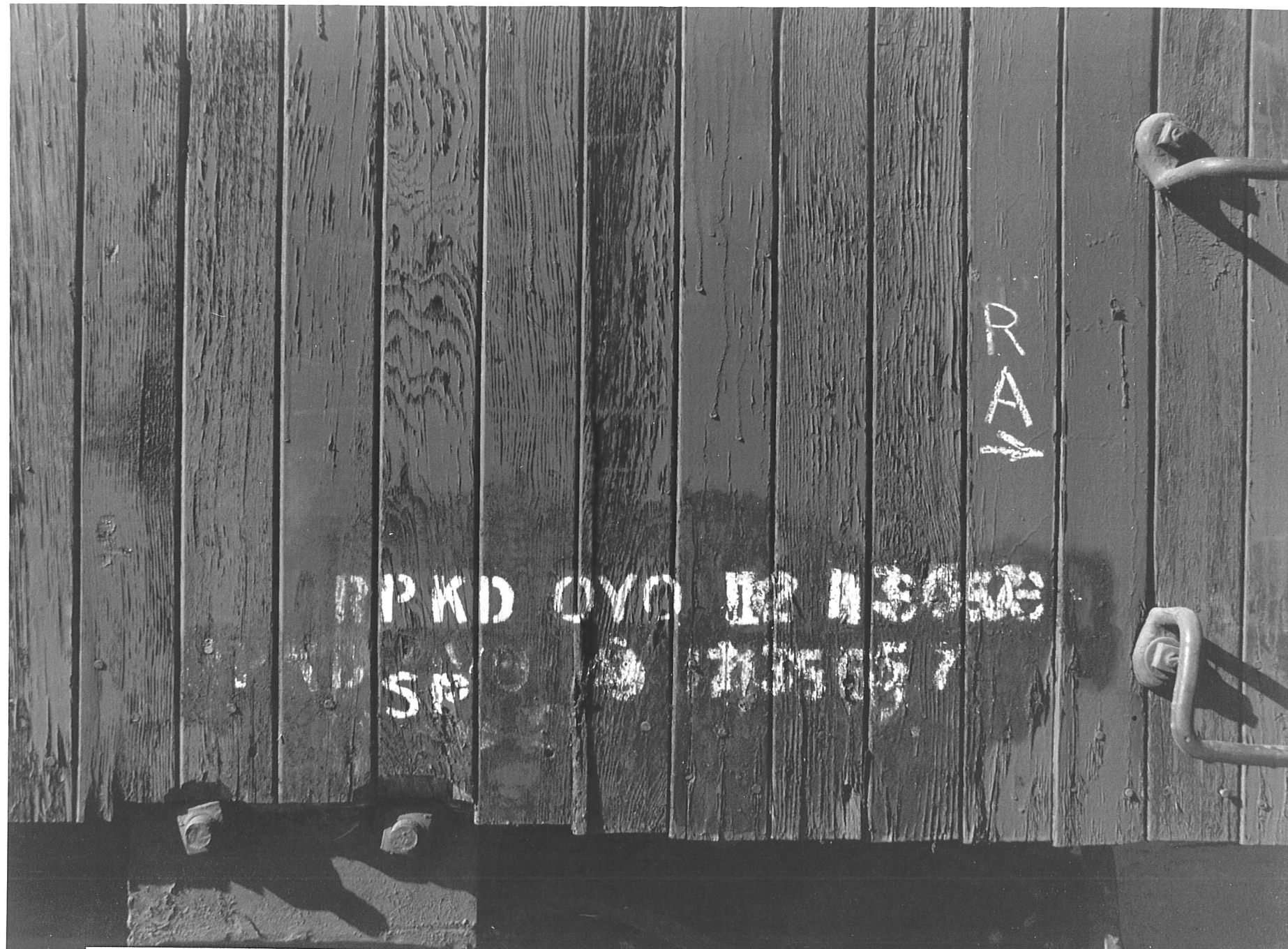


Photo #2 Repacking information

CSRM PHOTO



Photo #3 Air brake reservoir

CSRM PHOTO



Photo #4 Removing old siding at CSRM Restoration Shop

CSRM PHOTO

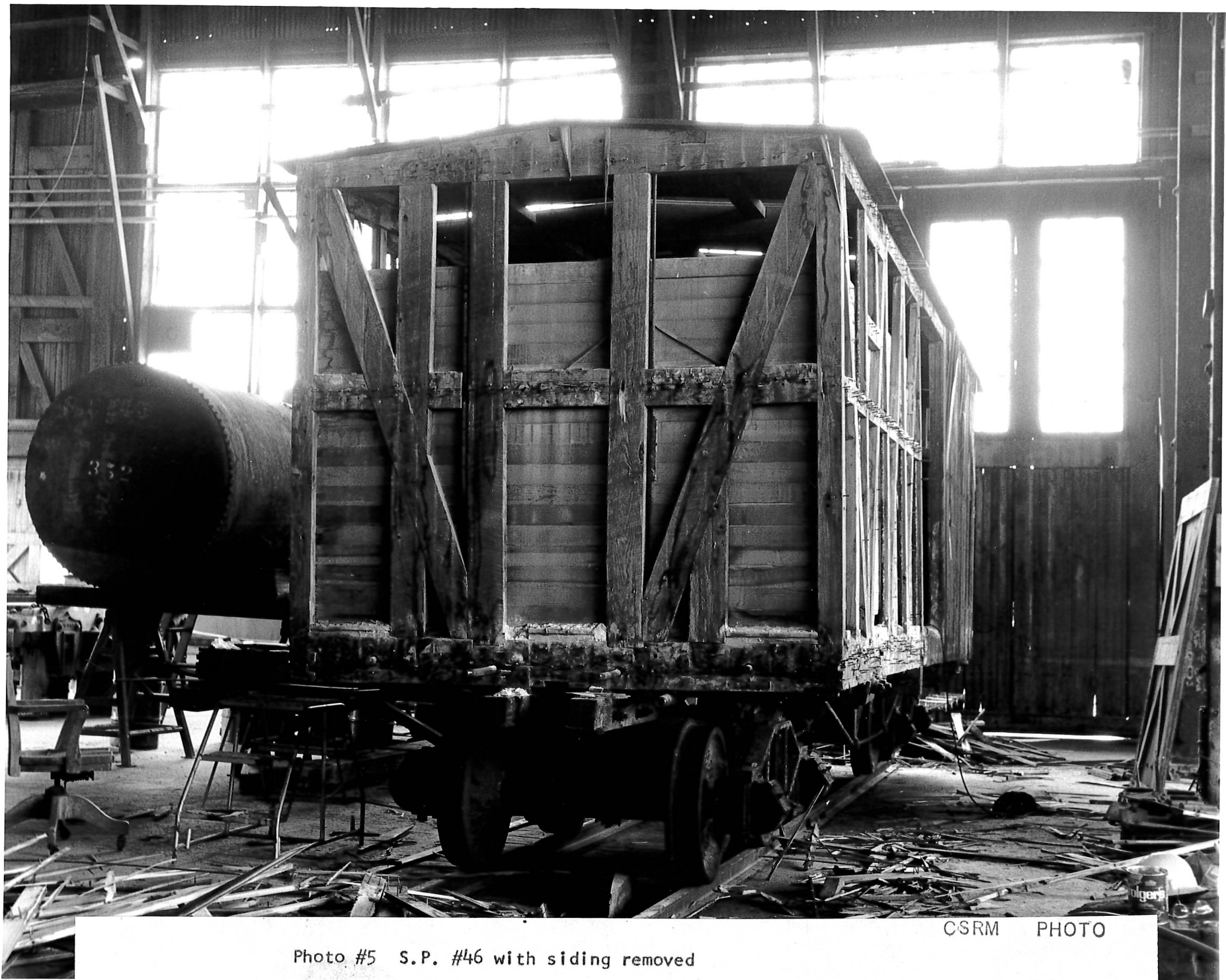


Photo #5 S.P. #46 with siding removed

CSRM PHOTO



CSRM PHOTO

Photo #6 S.P. #331 after restoration



Photo #7 S.P.#331 after restoration

CSRM PHOTO